Bureau for research, as research is ordinarily understood, but owing to the nature and extent of the machinery which it has at its disposal, including its corresponding members throughout the Dominions and Colonies, its technical advisory committees—active bodies comprising some 151 members, who are among the leading authorities on the respective minerals and the industries connected therewith—it is in an exceptional position for disseminating suggestions, shaping problems to which they give rise, and carrying out the necessary preliminary surveys, without which it would be difficult to advise as to whether a problem should be brought before organisations such, for instance, as the Department of Scientific and Industrial Research, the province of which is the carrying out of research.

The Genetics of Sex.

By PROF. R. RUGGLES GATES.

THE investigation of the chromosomes in a large number of insects and other animals has shown that the so-called X- and Y-chromosomes furnish a mechanical basis for the determination of sex in the fertilised egg, its inheritance in later generations, and the usual occurrence of approximate equality of the two sexes when one of them is heterozygous (XY or XO). The fundamental character of this relation between the X- and Y-chromosomes and sex is now generally admitted. It would appear that the difference in the chromosome content of the nuclei in the two sexes affects the metabolism during development in such a way as to produce one sex or the other, and in some groups to affect the secondary sexual characters as well. Combined cytological and breeding investigations have shown further that in most insects and mammals, including man, the male is the heterozygous sex, while in the Lepidoptera and birds the female is heterozygous.

Recent work on the subject of sex in animals accepts this situation, and is building upon it a further analysis of sex-differences. The most active lines of work have been (1) in connection with the discovery and interpretation of intersexes in various animals and plants, and (2) in the explanation of the departures from equality in the numbers of the sexes under a variety of conditions, normal or experimental. It is now clear that these results do not negative a chromosome hypothesis of the fundamental distinction between the sexes, at least in animals, but rather supplement it in an important way. Sex intergrades have been studied by Goldschmidt in the Gipsy moth, by Banta in Daphnia, and by Sturtevant and others in Drosophila; also in plants there have been the studies of intersexes in Mercurialis by Yampolsky and in Plantago by Bartlett and others. These investigations are still in progress, and it is only necessary to say that they are not out of harmony with a chromosome hypothesis of the origin of the sex-differences, although the situation in plants remains to be cleared up.

Of more immediate interest here are the cases where one of the sexes preponderates. Mr. Julian Huxley (see reference in NATURE, March 24, p. 116) has recently shown how in the millions fish (*Girardinus poeciloides*) a great preponderance of females, followed by a lesser preponderance of males, and finally by equality of the sex-ratio, can be best explained by assuming that the chromosome-constitution of the individual has been temporarily overridden by external influences. The important work of Riddle in controlling the sexes in pigeons may ultimately receive a similar explanation.

In an article by Mr. Alan S. Parkes (*Science Progress*, April, 1921) the author has applied somewhat similar conceptions to the explanation of the well-known departures from equality of the sex-ratios in man. The statistics from the reports of the Registrar-General, 1838–1914, show an average for this period of 1040 males to 1000 females. There is a similar preponderance of male births in most parts of the world, but in a few regions females preponderate. It is also a remarkable fact that fluctuation in the proportion of male births follows closely the rise and fall in the price of food. Statistics appear to show further a remarkable rise in the proportion of male births throughout Europe during the war, and it is suggested that war conditions were "in some obscure way beneficial to the welfare of the Y-gametes." That racial differences in the sex-ratio exist is shown by comparing Jews with Christians; it appears that the former in all countries show a greater excess of male births, while the crossing of races is also known to disturb the sex-ratios.

From a study of a number of genealogies of British families Mr. Parkes finds that families occur in which the preponderance of males is much greater than 1040 : 1000, and that this condition is inherited through the male, some strongly male-bearing strains producing more than 58 per cent. in excess of the above frequency considered as the normal.

A new type of inheritance of secondary sexual characters has recently been discovered by Schmidt (*C. r. Trav. Lab. Carlsberg*, vol. xiv., No. 8) in the fish *Lebistes reticulatus* from Trinidad. He shows that the inheritance of a black patch on the dorsal fin of the males in one race is transmitted exclusively from male parent to male offspring, never appearing in the female line at all. This is explained by assuming that the spot is determined by the Y-chromosome, for it is distributed in inheritance as the Y-chromosome is distributed. Hitherto in all cases investigated the Y-chromosome has appeared to be inactive in inheritance, the only evidence against this being the fact that males of Drosophila which lack it are sterile. The chromosomes of *Lebistes reticulatus* are now being investigated.

On the basis of this result of Schmidt, Castle (*Science*, April 8, p. 339) has built up an interesting speculation concerning the origin and relationships of the various types of sex-determining chromosomes. Briefly, his suggestion is that the X-chromosome was originally a cytoplasmic body handed on exclusively through the egg, like a plastid, and determining the female condition by its presence. This becomes included in the egg nucleus and is duplicated by splitting, thus giving rise to the condition XX in females and XO in males. If it does not split, a Y element may "develop" as its synaptic mate in the egg, passing later into male offspring, and, through non-disjunction (as in Drosophila), ultimately producing YY males which are assumed to be viable; they would give rise, as in Abraxas, to the condition in which the female is the heterozygous sex. In criticism it may be said that there is no cytological evidence of the transformation of a cytoplasmic body into a chromosome, unless the "chromatoid body" of Wilson be such a case. But it occurs in addition to the

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X-chromosomes. The sex-chromosomes, it is true, frequently differ in their behaviour from the other chromosomes, but the usual assumption that the Y in insects is undergoing gradual reduction has strong evidence in its favour, and the XO condition in males can be accounted for either by its ultimate disappearance in this way or by non-disjunction. This, however, admittedly leaves unexplained the origin of the condition in moths and birds, in which the female is the heterozygous sex.

Finally, it may be added that the discovery of sex chromosomes in the liverwort Sphærocarpos by Prof. Allen (Proc. Amer. Phil. Soc., vol. lviii., p. 289) places the sex differentiation of this group of plants in a new light, and affords a basis for an instructive comparison with the conditions in animals. For a large X-chromosome is found in the nuclei of the female gametophyte, and a small Y in the cells of the male gametophyte. The fertilised egg then contains an X and a Y, which are separated in sporogenesis. Half the spores contain an X and half a Y. This is quite different from the situation in insects where the XY combination produces a male. It is also simpler, the differentiation of the sexes arising through segregation of the X and Y, and the chromosome combination of the sporophyte corresponding to that of males in animal species in which the male is the heterozygous sex.

University and Educational Intelligence.

Cambridge.—Mr. P. Lake, St. John's College, has been reappointed to the Royal Geographical Society's readership in geography; Dr. J. A. Crowther, St. John's College, appointed University lecturer in physics as applied to medical radiology; and Mr. S. E. Hollingworth, of Clare College, elected to the Harkness scholarship in geology. The Wiltshire prize in geology has been awarded to Mr. A. G. Brighton, Christ's College, and Mr. H. C. G. Vincent, Fitzwilliam Hall.

Mr. W. Campbell Smith and Mr. R. H. Thouless have been elected fellows of Corpus Christi College.

Liverpool.—Dr. McLean Thompson, of the University of Glasgow, has been appointed to the Holbrook Gaskell chair of botany in succession to Prof. R. J. Harvey-Gibson, resigned.

London.—At a meeting of the Senate held on June 22 Sir Sydney Russell-Wells was re-elected Vice-Chancellor for the year 1921–22.

Dr. G. Cook was appointed to the University chair of mechanical engineering tenable at King's College, and Mr. L. Hawkes to the University readership in geology at Bedford College. The title of emeritus professor of philosophy and comparative psychology in the University was conferred on Mr. Carveth Read.

Grants were made from the Dixon Fund to Mr. F. J. F. Barrington, Mr. E. J. Evans, Prof. J. P. Hill, Miss G. Z. L. Le Bas, Mrs. M. M. Neilson-Jones, Prof. Karl Pearson, Mr. J. W. D. Robinson, Mr. D. M. Shaw, Mr. H. G. Smith, and Miss D. M. Wrinch.

The following doctorates were conferred:—*D.Sc. in Zoology:* Mr. W. A. Cunnington. *Ph.D. in the Faculty of Economics:* Mr. S. G. Panandikar. *Ph.D. in the Faculty of Science:* Mr. H. E. Cox and Mr. H. H. Morgan.

Manchester.—The sum of 1000*l*. has been contributed to the appeal fund by Alderman H. Plummer.

Oxford.—On Wednesday, June 22, the honorary degree of Doctor of Science was conferred on Prof. C. S. Sherrington, president of the Royal Society.

It is announced that Mr. F. S. Edie, lecturer in biochemistry at Aberdeen University, has been appointed to the chair of biochemistry in the University of Cape Town.

M. E. Deutsch de la Meurthe has made a donation of 10,000,000 francs to the University of Paris to provide for a university quarter where students may live at a moderate cost.

Mr. W. J. Jones, senior lecturer in chemistry in the University of Manchester, has been appointed professor of chemistry in the University College of South Wales and Monmouthshire, Cardiff; and Prof. A. W. Sheen, of the Welsh National School of Medicine, to the chair of medicine at the same institution.

The Aitchison memorial scholarship of the value of 36*l*., tenable in the full-time day courses in technical optics at the Northampton Polytechnic Institute, Clerkenwell, is being offered. The examination for the scholarship, open to both sexes, will be held on September 27 and 28. Full particulars can be obtained from Mr. H. F. Purser, 35 Charles Street, Hatton Garden, E.C.1.

Two scholarships, each of the value of 200*l*., are being offered by the Rubber Advisory Committee of the Northern Polytechnic Institute, Holloway, to enable students who have obtained a good degree in chemistry to attend for a year's special training in rubber technology. Applications, with particulars of the candidates' careers, copies of recent testimonials, and names of referees, must be sent to the Principal of the institute not later than July 5.

The announcement which appeared in the daily Press last week of the retirement of Prof. Henri Bergson from his chair at the Collège de France merely meant to his friends that he had at last given effect to an intention long contemplated. Owing to the strain of the international work which he undertook for the French Government with such fervour during the critical years of the war, he was compelled to avail himself of the privilege which the Collège allows its members of nominating a deputy, and for some time past M. Edouard Le Roy has occupied his place in the lecture-room. Now that Prof. Bergson is able to take up again the interrupted work of philosophy, he finds that he can hope to do original research only by obtaining relief from the routine work of lecturing. This, and nothing else, is the reason of the resignation which is now announced. The Collège de France, in which Prof. Bergson has held the chair of philosophy for more than twenty years, is a unique institution. Founded by Francis I. in 1530, in opposition to the Sorbonne and the universities, it has retained its high position and character. It is perhaps the only educational institution which survived the Revolution unchanged. Its lectures are without exception open to the public and free. Even a registered student cannot obtain the privilege of a reserved seat. When a professorial chair becomes vacant the successor is elected by the professors, who are not handicapped in their choice by academical regulations of any kind. The appointment entails the duty of delivering two courses of lectures in each session, neither of which may be a repetition of a course previously delivered either in the Collège or elsewhere.

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